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10/729,834	12/05/2003	Gary R. Holt	10006.001710	8546

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EXAMINER	
WERNER, DAVID N	
ART UNIT	**PAPER NUMBER**
2621	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/729,834	HOLT ET AL.	
	Examiner	Art Unit	
	David N. Werner	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-12 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-12 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 05 December 2003 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 20040618.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to because figures 5a and 6 are illegible, that is, they are of insufficient quality to show the blur region as described in the specification. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement-drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the examiner does not accept the changes, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The corresponding drawings in provisional application 60/431,384 are of acceptable quality, and will be referenced in the remainder of the Office action.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 3, 6, and 7 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by "Motion Compensated Enhancement of Noisy Image Sequences" (Kalivas et al.). Kalivas et al. teaches a noise algorithm. Regarding claims 1, 6, and 7, equation 15 of Kalivas et al. gives a motion compensated spatiotemporal filter, and equation 16 gives a spatiotemporal mean filter. Regarding the "object motion estimation for arbitrarily shaped segments" to align pixels, between a frame at time k and at time k+1, the motion of an object pixel is given according to a linear model (§ 2.2). A frame is segmented according to object indicator function λ, where for a given pixel (i,j) at frame k, λ(i,j,k) is set to 1 if the pixel is in the object, and 0 if not (§ 2.1). Then object indicator function λ serves as a weighting function. The segmentation model can be modified for multiple objects (equation 3). Regarding the "weighted average", in the spatiotemporal mean filter, the average of pixel values g(l,m,n) is then taken over region L in space-time window (Wni, Wnj, T), centered at point (in, jn) at time k. L is only counted in the region in which for a certain object, λ(l,m,n) is defined (§ 4.2). Regarding claim 3, in any exposed area in a given frame, that is, an area outside an object, weight λ is zero (§ 2.1), and so will not be counted in a temporal filter (§ 4.1).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 2 and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kalivas et al. in view of "Double-Window Hodges-Lehman (D) Filter and Hybrid D-Median Filter for Robust Image Smoothing" (Kundu et al.), and in view of European Patent Application EP 1100260 A1 (Borneo et al.) Kalivas et al. discloses the claimed invention except for taking into account boundary regions. Kundu et al. teaches two image smoothing filters that preserve edges (abstract). In the Hybrid D-Median Filter, regions are classified into quasi-constant (QC) regions with a Gaussian distribution with a small standard deviation, large linearly varying (LLV) regions with a Gaussian distribution with a large standard deviation, and quasi-two-valued (QTV) regions if the pixel values are centered around two distributions (§ III). Then, a QTV region is a boundary region. A regular D filter may work for a QC region or LLV region, but not a QTV region. If a region is determined to be a QC region, a conventional D filter determines its central value, but if it is a QTV region, its central value is replaced by the median of the pixels in the window (§ III). Kundu et al. teaches that it was known to perform different filtering techniques on edge regions and flat regions in an image. Therefore, it would have been obvious to one having ordinary skill in the art to handle

edges in an image segment differently from other areas in an image in a filter as taught by Kundu et al., since Kundu et al. states in section IV that such a modification would increase filter performance in the presence of Gaussian noise by preserving edges in the filtered image. Then Kalivas et al., now incorporating the Kundu et al. use of a special filtering technique near object edges, satisfies the majority of limitations of claims 2 and 8-10. However, this combination does not teach the limitation of adjusting pixel weights in the boundary regions.

Kalivas et al. in combination with Kundu et al. discloses the claimed invention except for adjusting pixel weight in the boundary of a segment in an image. Borneo et al. teaches a spatiotemporal noise filtering method. Regarding claims 2 and 8, Borneo et al. first chooses a working window composed of pixels near a selected pixel P [0049]. Then, pixels near the center of the window produce a weighted average [0057] based on the distance from the pixel to the center of the window. The pixel at the window center itself may or may not contribute to the weighted average [0058]. Regarding adjusting weights in boundary regions, Figure 4 shows of Borneo et al. shows a weighting function for pixels at threshold intervals of Th away from CENTERj, the center of the working window. The weights are halved at each threshold distance [0064]. By placing the center of a working window at the center of a segment in the image, boundary sections of the image have less weight. Regarding claims 9 and 10, a "tail detect" block can be provided to suppress a "comet tail effect" that occurs when the

weight factor is overestimated. A tail detection block may disable weighting pixels from a previous frame, or reduce their weights [0068].

Borneo et al. teaches that it was known to reduce pixel weight for pixels away from the center of a region in an image. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust pixel weights in boundary areas as taught by Borneo et al., since Borneo et al. states in paragraph [0028] that such a modification would suppress noise peaks. Then, Kalivas et al. and Kundu et al., now incorporating the Borneo et al. adjusted-weight filter windows, satisfies every limitation of claims 2 and 8-10.

6. Claims 4 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kalivas et al. Kalivas et al. is silent about Groups of Pictures (GOPs). However, the examiner takes Official Notice that the limitation of "determining additional motion information across GOP boundaries" is a well-known part of the MPEG standard. A GOP for which motion information can be taken across GOP boundaries is known in the art as an "Open GOP". It would have been obvious for one having ordinary skill in the art at the time the invention was made to include a filter on a video stream having open GOPs, since open GOPs allow for reduced bandwidth in an encoded image sequence.

7. Claims 5 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kalivas et al. in view of US Patent 5544239 A (Golin et al.). Kalivas et al. does not teach adjusting a temporal filter based on a lighting offset. Golin et al. teaches a motion

estimation method that compensates for a fading image. Regarding claims 5 and 12, Figure 1 of Golin et al. shows brightness adjustment unit 104, which calculates base image 106 by reducing pixels in an image by the average pixel brightness in the image and in the next image (column 2, lines 43-53). This is in response to fade detector 101, which stores the frame in a buffer if a sequence is fading (column 2, lines 25-42). Motion analysis unit 108 then determines displacement vectors between the current image and the previous base image (column 3, lines 16-25). Kalivas discloses the claimed invention except for calculating a lighting offset. Golin et al. teaches that it was known to calculate motion analysis in an image sequence based on images with adjusted brightness. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to add a brightness adjustment unit to a motion analysis system as taught by Golin et al., since Golin et al. states in column 1, lines 41-55 that such a modification would increase accuracy of motion estimation.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent 5,070,413 (Sullivan et al.) discloses a color half-toning system that sets blur weights to zero for pixels at a color edge. US Patent 5,351,095 A (Kerdranvat) discloses a motion estimation method that accounts for pixel brightness gradients. US Patent 5,473,384 A (Jayant et al.) discloses a spatiotemporal filter that performs a multi-level median filter on edge pixels. International Application WO 99/57906 (Sharma et al.) discloses a frame interpolator that uses a spatiotemporal

median filter. "Adaptive Motion-Compensated Filtering of Noisy Image Sequences" (Ozkan et al.) discloses an adaptive weighted averaging filter specialized for image sequences with rapid scene changes.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner whose telephone number is (571) 272-9662. The examiner can normally be reached on Monday-Friday from 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DNW